

## Table of Contents — 1999

February 1999

### Editorial • Pierre J. Carreau .....

### Articles

- The Efficiency of Short Airlift Pumps Operating at Low Submergence Ratios • Fabrice Lawniczak, Pierre Francois, Olivier Scrivener, Eleftherios G. Kastrinakis and Stavros G. Nychas .....
- Gas Holdup in Homogeneous and Heterogeneous Gas-Liquid Bubble Column Reactors • Amir Sarrafi, Mohammad Jamilahmadi, Hans Müller-Steinhagen and John M. Smith .....
- Effect of Pulp Fibres on Gas Holdup in a Flotation Column • Peter Janse, Cesar O. Gomez and James A. Finch .....
- Influence of Ring-Type Internals on Axial Pressure Distribution in Circulating Fluidized Bed • Jianjie Bu and Jing-Xu Zhu .....
- Étude hydrodynamique des lits fluidisés sous vide et sous haute température • J. Ramiro Rodriguez Ruvalcaba, Brigitte Caussat, Merhdji Hemati et Jean-Pierre Couderc .....
- An Investigation of Heat Transfer from a Vertical Tube in a Spouted Bed • Aturo Macchi, Hsiaotao T. Bi, Robert Legros and Jamal Chaouki .....
- Numerical Study of Laminar Condensation of Downward Flowing Vapour on a Single Horizontal Cylinder or a Bank of Tubes • Mohamed Asbib, Abdallah Daif, Prabodh Kumar Panday and Ahmed Khmou .....
- Two-Liquid Flotation of Fine Oxide Particles with 8-Hydroxyquinoline • E. Kusaka, K. Maegawa, Y. Fukunaka, M. Niniae and Y. Nakahiro .....
- Mass Transfer Parameter Estimation Using Optimization Technique: Case Study in CO<sub>2</sub> Absorption with Chemical Reaction • Xinheng Ji, Weerapong Kritiphat, Ahmed Aboudheir and Paitoon Tontiwachwuthikul .....
- The Futility of Raffinate Reflux Revisited • D. P. Rao ..
- The Co-Catalyzed Conversion of H<sub>2</sub>S to H<sub>2</sub> + Sulfur Part 2. The Thermal Decomposition of CO<sub>2</sub> • Farhad Faraji, Imre Safrak, Otto P. Strausz, Erdal Yildirim and Manuel E. Torres .....
- The Ignition Temperature of Lignite Char in a Fluidized Bed Combustor • Dennis van Puyvelde and John Stubington .....
- Ion Exchange Equilibria in Binary and Ternary Systems • William D. A. Boyer, Malcolm H. I. Baird and I. Nirdosh .....
- High Concentrations Ammonia Removal by the Cyanobacterium Plectonema Boryanum in a Photobioreactor System • Anand Prakash, Argyrios Margaritis, Richard C. Saunders and Sivaraman Vijayan .....

### Notes

- Laminar Flow in Certain Ducts of Symmetric Cross Section • C. Y. Wang .....
- A Numerical Study of Steady Incompressible Newtonian Fluid Flow Over a Disk at Moderate Reynolds Numbers • Basudeb Munshi, Rajendra P. Chhabra and Partha Sarathi Ghoshdastidar .....
- Inlet Plenum Pressure Drop Calculation for a Cross-Flow Module • Ken Darcovich, Floyd N. Toll, François Paynot and Erik Pélerin .....
- Two Dimensional Flow Deflection Screen Model • Lanre Oshinowo, David C. S. Kuhn and Michael E. Charles .....
- Pressure Drop Prediction in Hydraulic Transport of Bi-Dispersed Particles of Coal and Copper Ore in Pipeline • Kartik Chandra Ghanta and N. K. Purohit .....
- A Radial Void Fraction Correlation for Packed Bed Tubes • Gary E. Mueller .....

Kinetics of Leaching of Tunisian Phosphate Ore Particles in Dilute Phosphoric Acid Solutions • Faouzi Ben Brahim, Arbi Mgaidi and Mohamed Elmaaoui .....	136
Chromic Acid Removal by Anion Exchange • Henry K. S. Tan .....	143
Noncatalytic and Catalytic Pyrolysis of Toluene • Kamal K. Pant and Deepak Kunzru .....	150
Catalytic Conversion of Palm Oil to Fuels and Chemicals • Tan Yee Leng, Abdul Rahman Mohamed, Subhash Bhatia .....	156
Treatment of Industrial Wastewater using Zeolite and Sepiolite, Natural Microporous Materials • Maria Franca Brigatti, Giancarlo Franchini, Paola Frigieri, Christian Gardinali, Luca Medici and Luciano Poppi .....	163
The Modified Dynamic Model of a Riser Type Fluid Catalytic Cracking Unit • Pathanjali Malay, Bruce J. Milne and Sohrab Rohani .....	169
A New Direct-Synthesis Tuning Method for PI-Controllers • Chan Sul Jung, Hyung Keun Song and Jae Chun Hyun .....	180
On the Fuzzy Logic for Rule Based Modeling and Process Simulation • Yu Qian and Pei-Rong Zhang .....	186
Contents Page from Chemical Engineering Research and Design, January 1999 .....	190
 Book Review	
Process Dynamics Modeling, Analysis, and Simulation • Denis Dochain .....	156
Summary of Policy on the Use of SI Units .....	192
Instructions to Authors .....	I.B.C.
 April 1999	
Special Issue in Honour of Professor M. A. Bergougno .....	
Preface • J. Zhu, H. I, de Lasa and Cl. L. Briens .....	193
 Special Articles	
Flow Development in a Gas-Solids Downer Fluidized Bed • Hui Zhang, Jing-Xu (Jesse) Zhu and Maurice A. Bergougno .....	194
Effects of the Gas/Solids Distributor on the Local and Overall Solids Distribution in a Downer Reactor • Peter Lehner and Karl-Ernst Wirth .....	199
Bed-to-Wall Heat Transfer in a Downer Reactor • Yong Jeon Kim, Jin Hwan Bang and Sang Done Kim .....	207
Heat Transfer between FCC Catalyst and an Electrically Heated Horizontal Cylinder in a Circulating Fluidized Bed • Yann Courbariaux, Todd Pugsley and Michel Couturier .....	213
Flow Patterns in High-Velocity Fluidized Beds and Pneumatic Conveying • H. T. Bi and John R. Grace .....	223
The Influence of Particle Size and Density on the Radial Gas Mixing in the Dilute Region of the Circulating Fluidized Bed • Maria Laura Mastellone and Umberto Arena .....	231
Collapse of Dilute Suspension in Different Circulating Fluidized Bed Risers with Respect to Different Particles • Guangwen Xu, Kousuke Nomura, Nobuyoshi Nakagawa and Kunito Kato .....	238
Chaotic Characteristics of Local Voidage Fluctuation in a Circulating Fluidized Bed • Hiroaki Ohara, Hongshen Ji, Koji Kuramoto, Atsushi Tsutsumi, Kunito Yoshida and Toshimasa Hirama .....	247
Position and Velocity of a Large Particle in a Gas/Solid Riser using the Radioactive Particle Tracking Technique • Larin Godfrey, Faïçal Larachi and Jamal Chaouki .....	253
Mass Transfer and Influence on the Local Catalyst Activity on the Conversion in a Riser Reactor • Rob H. Venderbosch, Wolter Prins, Wim P. M. van Swaaij .....	262

## Table of Contents — 1999

February 1999

### Editorial • Pierre J. Carreau .....

### Articles

- The Efficiency of Short Airlift Pumps Operating at Low Submergence Ratios • Fabrice Lawniczak, Pierre Francois, Olivier Scrivener, Eleftherios G. Kastrinakis and Stavros G. Nychas .....
- Gas Holdup in Homogeneous and Heterogeneous Gas-Liquid Bubble Column Reactors • Amir Sarrafi, Mohammad Jamilahmadi, Hans Müller-Steinhagen and John M. Smith .....
- Effect of Pulp Fibres on Gas Holdup in a Flotation Column • Peter Janse, Cesar O. Gomez and James A. Finch .....
- Influence of Ring-Type Internals on Axial Pressure Distribution in Circulating Fluidized Bed • Jianjie Bu and Jing-Xu Zhu .....
- Étude hydrodynamique des lits fluidisés sous vide et sous haute température • J. Ramiro Rodriguez Ruvalcaba, Brigitte Caussat, Merhdji Hemati et Jean-Pierre Couderc .....
- An Investigation of Heat Transfer from a Vertical Tube in a Spouted Bed • Aturo Macchi, Hsiaotao T. Bi, Robert Legros and Jamal Chaouki .....
- Numerical Study of Laminar Condensation of Downward Flowing Vapour on a Single Horizontal Cylinder or a Bank of Tubes • Mohamed Asbib, Abdallah Daif, Prabodh Kumar Panday and Ahmed Khmou .....
- Two-Liquid Flotation of Fine Oxide Particles with 8-Hydroxyquinoline • E. Kusaka, K. Maegawa, Y. Fukunaka, M. Niniae and Y. Nakahiro .....
- Mass Transfer Parameter Estimation Using Optimization Technique: Case Study in CO<sub>2</sub> Absorption with Chemical Reaction • Xinheng Ji, Weerapong Kritiphat, Ahmed Aboudheir and Paitoon Tontiwachwuthikul .....
- The Futility of Raffinate Reflux Revisited • D. P. Rao ..
- The Co-Catalyzed Conversion of H<sub>2</sub>S to H<sub>2</sub> + Sulfur Part 2. The Thermal Decomposition of CO<sub>2</sub> • Farhad Faraji, Imre Safrak, Otto P. Strausz, Erdal Yildirim and Manuel E. Torres .....
- The Ignition Temperature of Lignite Char in a Fluidized Bed Combustor • Dennis van Puyvelde and John Stubington .....
- Ion Exchange Equilibria in Binary and Ternary Systems • William D. A. Boyer, Malcolm H. I. Baird and I. Nirdosh .....
- High Concentrations Ammonia Removal by the Cyanobacterium Plectonema Boryanum in a Photobioreactor System • Anand Prakash, Argyrios Margaritis, Richard C. Saunders and Sivaraman Vijayan .....

### Notes

- Laminar Flow in Certain Ducts of Symmetric Cross Section • C. Y. Wang .....
- A Numerical Study of Steady Incompressible Newtonian Fluid Flow Over a Disk at Moderate Reynolds Numbers • Basudeb Munshi, Rajendra P. Chhabra and Partha Sarathi Ghoshdastidar .....
- Inlet Plenum Pressure Drop Calculation for a Cross-Flow Module • Ken Darcovich, Floyd N. Toll, François Paynot and Erik Pélerin .....
- Two Dimensional Flow Deflection Screen Model • Lanre Oshinowo, David C. S. Kuhn and Michael E. Charles .....
- Pressure Drop Prediction in Hydraulic Transport of Bi-Dispersed Particles of Coal and Copper Ore in Pipeline • Kartik Chandra Ghanta and N. K. Purohit .....
- A Radial Void Fraction Correlation for Packed Bed Tubes • Gary E. Mueller .....

Kinetics of Leaching of Tunisian Phosphate Ore Particles in Dilute Phosphoric Acid Solutions • Faouzi Ben Brahim, Arbi Mgaidi and Mohamed Elmaaoui .....	136
Chromic Acid Removal by Anion Exchange • Henry K. S. Tan .....	143
Noncatalytic and Catalytic Pyrolysis of Toluene • Kamal K. Pant and Deepak Kunzru .....	150
Catalytic Conversion of Palm Oil to Fuels and Chemicals • Tan Yee Leng, Abdul Rahman Mohamed, Subhash Bhatia .....	156
Treatment of Industrial Wastewater using Zeolite and Sepiolite, Natural Microporous Materials • Maria Franca Brigatti, Giancarlo Franchini, Paola Frigieri, Christian Gardinali, Luca Medici and Luciano Poppi .....	163
The Modified Dynamic Model of a Riser Type Fluid Catalytic Cracking Unit • Pathanjali Malay, Bruce J. Milne and Sohrab Rohani .....	169
A New Direct-Synthesis Tuning Method for PI-Controllers • Chan Sul Jung, Hyung Keun Song and Jae Chun Hyun .....	180
On the Fuzzy Logic for Rule Based Modeling and Process Simulation • Yu Qian and Pei-Rong Zhang .....	186
Contents Page from Chemical Engineering Research and Design, January 1999 .....	190
 Book Review	
Process Dynamics Modeling, Analysis, and Simulation • Denis Dochain .....	156
Summary of Policy on the Use of SI Units .....	192
Instructions to Authors .....	I.B.C.
 April 1999	
Special Issue in Honour of Professor M. A. Bergougno .....	
Preface • J. Zhu, H. I, de Lasa and Cl. L. Briens .....	193
 Special Articles	
Flow Development in a Gas-Solids Downer Fluidized Bed • Hui Zhang, Jing-Xu (Jesse) Zhu and Maurice A. Bergougno .....	194
Effects of the Gas/Solids Distributor on the Local and Overall Solids Distribution in a Downer Reactor • Peter Lehner and Karl-Ernst Wirth .....	199
Bed-to-Wall Heat Transfer in a Downer Reactor • Yong Jeon Kim, Jin Hwan Bang and Sang Done Kim .....	207
Heat Transfer between FCC Catalyst and an Electrically Heated Horizontal Cylinder in a Circulating Fluidized Bed • Yann Courbariaux, Todd Pugsley and Michel Couturier .....	213
Flow Patterns in High-Velocity Fluidized Beds and Pneumatic Conveying • H. T. Bi and John R. Grace .....	223
The Influence of Particle Size and Density on the Radial Gas Mixing in the Dilute Region of the Circulating Fluidized Bed • Maria Laura Mastellone and Umberto Arena .....	231
Collapse of Dilute Suspension in Different Circulating Fluidized Bed Risers with Respect to Different Particles • Guangwen Xu, Kousuke Nomura, Nobuyoshi Nakagawa and Kunito Kato .....	238
Chaotic Characteristics of Local Voidage Fluctuation in a Circulating Fluidized Bed • Hiroaki Ohara, Hongshen Ji, Koji Kuramoto, Atsushi Tsutsumi, Kunito Yoshida and Toshimasa Hirama .....	247
Position and Velocity of a Large Particle in a Gas/Solid Riser using the Radioactive Particle Tracking Technique • Larin Godfrey, Faïçal Larachi and Jamal Chaouki .....	253
Mass Transfer and Influence on the Local Catalyst Activity on the Conversion in a Riser Reactor • Rob H. Venderbosch, Wolter Prins, Wim P. M. van Swaaij .....	262

The NO and N <sub>2</sub> O Formation Mechanism under Circulating Fluidized Bed Combustor Conditions: from the Single Particle to the Pilot-Scale • Franz Winter, Gerhard Löffler, Christian Wartha, Hermann Hofbauer, Fernando Preto and Edward J. Anthony . . . . .
The Axial Hydrodynamic Behavior in a Liquid-Solid Circulating Fluidized Bed • Ying Zheng, Jing-Xu (Jesse) Zhu, Jianzhang Wen, Steve A. Martin, Amarjeet S. Bassi and Argyrios Margaritis . . . . .
High-Velocity Fluidization of Solid Particles in a Liquid-Solid Circulating Fluidized Bed System • Koji Kuramoto, Atsushi Tsutsumi and Tadatoshi Chiba . . . . .
Application of Dynamic Pressure Probe Technique to Characterize a Circulating Fluidized Bed • Janne H. Pärssinen, Pasti Hagelberg, Isto Eilos and Juhani Attamaa . . . . .
Fluidized Bed Catalytic Reactor Modeling across the Flow Regimes • John R. Grace, Ibrahim A. Abba, Hsiaotao Bi and Michael L. Thompson . . . . .
Hydrodynamic Characteristics of Magnetically Stabilized Fluidized Admixture Beds of Iron and Copper Particles • Satish C. Saxena and Wei Y. Wu . . . . .
Characterization of Gas Fluidized Beds of Group C, A and B Particles based on Pressure Fluctuations • Dingrong Bai, John R. Grace and Jing-Xu Zhu . . . . .
Modeling of Biomass Devolatilization in a Fluidized Bed Reactor • Renzo Di Felice, Gianfilippo Coppola, Sergio Rapagna and Nader Jand . . . . .
From Hygroscopic Single Particle to Batch Fluidized Bed Drying Kinetics • Jens Burgschweiger, Hans Groenewold, Carola Hirshmann and Evangelos Tsotsas . . . . .
Novel Technologies of VOC Decontamination in Fixed, Moving and Fluidized Catalyst-Adsorbent Beds • Alexandre F. Dolodovich, Galina S. Akhremkova and Vyacheslav S. Efremtsev . . . . .
Removal of SO <sub>2</sub> from Flue Gas using a New Semidry Flue Gas Desulfurization Process with a Powder-Particle Spouted Bed • Xiaoxun Ma, Takao Kaneko, Qimin Guo, Guangwen Xu and Kunio Kato . . . . .
Simulations of the Effect of Hydrodynamic Conditions and Properties of Membranes on the Catalytic Performance of a Fluidized-Bed Membrane Reactor for Partial Oxidation of Methane • Thomas Ostrowski and Leslaw Mlezko . . . . .
On the Measurements of Regime Transition in High-Pressure Bubble Columns • T.-J. Lin, K. Tsuchiya and Liang-Shih Fan . . . . .
Local Measurements for the Study of External Loop Airlift Hydrodynamics • Marianne Utiger, Frank Stuber, Anne-Marie Duquenne, Henri Delmas and Christophe Guy . . . . .
Effects of Sparger Height and Orifice Orientation on Solids Dispersion in a Slurry Bubble Column • Bimal Gandhi, Anand Prakash and Maurice A. Bergougou . . . . .
Use of New Reaction Kinetics for COS Formation to Achieve Reduced Sulfur Emissions from Claus Plants • Kunal Karan, Anil K. Mehrotra and Leo A. Behie . . . . .
Wet Oxidation of Bleach Plant Effluent: Effects of pH on the Oxidation with or without a Pd/Al <sub>2</sub> O <sub>3</sub> Catalyst • Qinglin Zhang and Karl T. Chuang . . . . .
Dynamic Analysis of Adsorption Equilibrium and Rate Parameters of Reactants and Products in MTBE, ETBE and TAME Production • Nuray Oktar, Kirali Mürtezaoglu, Timur Doğu and Gülsen Doğu . . . . .
Contents Page from Chemical Engineering Research and Design, March 1999 . . . . .
MTBE Synthesis in a Novel Riser Simulator • Hugo de Lasa, Pierre Fournier, Anand Prakash and Tarek El Sohly . . . . .

June 1999

## Articles

275 The Onset of Liquid Entrainment during Discharge from Two Branches on an Inclined Wall • Ibrahim G. Hassan, Hassan M. Soliman, Grant E. Sims and Janusz E. Kowalski . . . . .	433
284 Estimation of Phase Velocities at Flooding Point in Packed Columns for any Gas/Liquid System • Irena Kuźniewska-Lach . . . . .	439
291 Détermination expérimentale et prédition des temps de circulation et de mélange pour un système d'agitation hélicoïdal • Guillaume Delaplace, Jean-Yves Dieulot, Jean-Paul Brienne et Jean-Claude Leuliet . . . . .	447
299 Bubble Formation in Concurrently Upward Flowing Liquid • Koichi Terasaka, Hideki Tsuge and Hirokazu Matsue . . . . .	458
305 Resination and Decarboxylation Reactions in Fusion Synthesis of Ca-Resinates • Satu Sundqvist, Erkki Paatero and Harri Tenhola . . . . .	465
312 Kinetics and Mechanism of the Reaction Between Ozone and Hydrogen Peroxide in Aqueous Solutions • Chiang-Hai Kuo, Li Zhong, Mark E. Zappi and Andrew P. Hong . . . . .	473
325 Preparation of the Mn <sup>4+</sup> -Al <sub>2</sub> O <sub>3</sub> Acceptor for High Temperature Regenerative H <sub>2</sub> S Removal • Bin Liang, Rob Korbee, Albert W. Gerritsen and Cor M. van Den Bleek . . . . .	483
333 Kinetics of Acetalization of Perfumery Aldehydes with Alkanols over Solid Acid Catalysts • G. D. Yadav and A. A. Pujari . . . . .	489
342 Increase of Ethanol Productivity in an Airlift Reactor with a Modified Draught Tube • António A. Vicente, Marián Dluhý and José A. Teixeira . . . . .	497
356 Modélisation de nanofiltration/osmose inverse en tenant compte du facteur de séparations minimale et maximale • Yazhen Xu et Rémi E. Lebrun . . . . .	503
356 Leaching of Uranium and <sup>226</sup> Ra from Low-level Radioactive Waste from Port Hope, Ontario • Inderjit Nirdosh . . . . .	508
363 Methanol-based Pulping of Eucalyptus Globulus • M. A. Gilarranz, M. Oliet, F. Rodríguez and J. Tijero . . . . .	515
370 Étude de l'influence du mode d'anodisation sur la cinétique de croissance des films d'alumine en milieu acide sulfurique • Noureddine Azzouz, Kamel Belmokre, Habib Taalla et Jacques Pagetti . . . . .	522
375 Corrosion des aciers et superalliages inoxydables en eau tritée - influence du tritium et des espèces radiolytiques • Gilbert Bellanger . . . . .	530
383 Sunflower Protein Precipitation in a Tubular Precipitator • Matheo Raphael and Sohrab Rohani . . . . .	540
392 Notes	
392 Global Degradation Kinetics of Wood and Agriculture Residues in Air • Coloma Di Blasi and Carmen Branca . . . . .	555
399 Hydrodynamics and Particle Collection in Turbulent Bed Contactor • Marcelino L. Gimenes and Douglas Handley . . . . .	562
406 Pressure and Voidage Fluctuations in Slugging Fluidized Beds • Hsiaotao Bi . . . . .	568
412 Hydrodynamic Behavior of Single Particles in a Draft-Tube Bubble Column • Ken-Ichi Kikuchi, Hiroshi Takahashi, Yutaka Takeda and Fumiya Sugawara . . . . .	573
412 Pressure Losses in Orifices for the Flow of Gas-Non-Newtonian Liquids • Arun Kumar Samanta, Tapan Kumar Banerjee and Sudip Kumar Das . . . . .	579
413 Mass Transfer Modeling during Cross-flow Filtration of Non-Newtonian Fluids • Hélène Carrère, Frédéric René and Antonio Lorizzo . . . . .	584
420 Optimal Seeding in Batch Crystallization • Serena H. Chung, David L. Ma and Richard D. Braatz . . . . .	590
420 Contents Page from Chemical Engineering Research and Design, May 1999 . . . . .	596
432 Transient Response of Granular Bed Motion in Rotary Kiln • V. Sriram and P. S. T. Sai . . . . .	597
I.B.C. Plasmid Stability Analysis in a Non-Homogeneous Bioreactor for a Recombinant Fed-Batch Fermentation • Pratap R. Patnaik . . . . .	602

## Regular Article

Modeling of an Internally Circulating Fluidized Bed Reactor for Thermal Treatment of Industrial Solid Wastes • Lukanda Mukadi, Christophe Guy and Robert Legros . . . . .

Résumé de la politique concernant les unités SI . . . . .

Instructions aux auteurs . . . . .

Contents Page from Chemical Engineering Research and Design, June 1999	607
Summary of Policy on the use of SI Units	608
Instructions to Authors	I.B.C.

August 1999

## Articles

Turbulent Dispersion Coefficients in Cyclone Flow: An Empirical Approach • Romualdo L. Salcedo and Manuel A. Coelho	609
The Effects of Temperature and Viscosity on Glucose Diffusivity through <i>Saccharomyces cerevisiae</i> Biofilms • Attilio Converti, Mario Zilli, Saleh Arni, Renzo Di Felice and Marco Del Borghi	618
Rheological Properties of Aqueous $\alpha$ -Al <sub>2</sub> O <sub>3</sub> Suspensions: Influence of Dispersant Concentration • Andreja Zupančič, Romano Lapasin and Annika Kristoffersson	627
Dispositif simple et performant pour disperser un gaz dans un liquide en vue d'effectuer des réactions chimiques ou biochimiques en présence ou non de particules solides • Roger Botton	637
An Experimental Study of Double-to-Single-Loop Transition in Stirred Vessels • G. Montante, K.C. Lee, A. Brucato and M. Yianneskis	649
Influence of Geometry and Solids Concentration on the Hydrodynamics and Mass Transfer of a Rectangular Airlift Reactor for Marine Sediment and Soil Bioremediation • Montserrat Tobajas, Marc H. Siegel and Sabine E. Apitz	660
Decrement Estimation of the Heat Transfer Coefficient in Mixture Boiling • Junjie Gu and Hans-Jörg Bart	670
Removal of Acetic Acid from Water by Catalytic Distillation. Part 1: Experimental Studies • Zhanping Xu, Artin Afacan and Karl T. Chuang	676
Removal of Acetic Acid from Water by Catalytic Distillation. Part 2: Modeling and Simulation Studies • Zhanping Xu, Artin Afacan and Karl T. Chuang	682
Catalytic Combustion of Methane in a Monolith Washcoat: Effect of Water Inhibition on the Effectiveness Factor • Robert E. Hayes, Serpil Awdry and Stan T. Kolaczkowski	688
Theoretical and Experimental Analysis of Methane Steam Reforming in a Membrane Reactor • Giuseppe S. Madia, Giuseppe Barbieri and Enrico Drioli	698
Developmental Studies of an Adaptive On-line Pulsensor for Biological Wastewater Treatments • L. Jose, Garcia Sanchez, W. Campbell Robinson and Hector Budman	707
Equilibrium Conditions for the Hydrogen Sulfide Hydrate Formation in the Presence of Electrolytes and Methanol • Kal N. Mahadev and P. Raj Bishnoi	718
Assessing the Precision of Model Predictions and Other Functions of Model Parameters • Shannon L. Quinn, David W. Bacon and Thomas J. Harris	723

## Notes

Effect of the Grid-Velocity on Attrition in Gas Fluidized Beds • Shu-Yii Wu, Jan Baeyens and Chen-Yeon Chu	738
On the Scaling-up of a Two-stage Air Blown Entrained Flow Coal Gasifier • Caixia Chen, Takahiro Miyoshi, Hidehiro Kamiya, Masayuki Horio and Toshinori Kojima	745
Onset of Pulsing in Trickle Beds: Evaluation of Current Tools and State-of-the-art Correlation • F. Larachi, I. Ilia, M. Chen and B.P.A. Grandjean	751
Liquid Holdup Measurement Techniques in Laboratory High Pressure Trickle Bed Reactors • Muthanna Al-Dahan and Wes Highfill	759
Contents Page from Chemical Engineering Research and Design, July 1999	765
A Note on the Drag Coefficient of a Single Gas Bubble in a Power-Law Fluid • Denis Rodrigue, Daniel De Kee and Chen Feng Chan Man Fong	766

Numerical Correlation for Thermal Conduction in Packed Beds • Kurt O. Lund, Huy Nguyen, Stephen M. Lord and Chrystal Thompson	769
Optimization of Air Distribution in Direct Reduction Process in Rotary Kilns • V. Ramakrishnan and P.S.T. Sai	775
Summary of Policy on the Use of SI Units	784
Instructions to Authors	I.B.C.
 October 1999	
Special Issue in Honour of Professor Campbell W. Robinson	
Preface • D. Grant Allen, Tom Fahidy and Milan Popovic	785
 Special Articles	
Mixing in Multiple-Impeller Stirred Tank Reactors with Boiling Liquids • Naoki Dohi, Yukimasa Matsuda, Norihiro Itano, Kazuhiro Shimizu, Kimio Minekawa and Yoshinori Kawase	786
Stability of Gas-Inducing Type Impellers • Swapnil S. Patil and Jyeshtharaj B. Joshi	793
Characterization of an Airlift Reactor with Helical Flow Promoters • Cord Schröderburg, Michail Gluz, Milan Popovic and Jose C. Merchuk	804
Radial Liquid Velocity Distribution in an External-Loop Airlift Column with a Tapered Riser • Mikio Kawagoe, Shohei Yoshida, Yukimasa Ishii and Kazumitsu Naoe	811
Mass Transfer Properties of Bubble Columns Suspending Immobilized Glucose Oxidase Gel Beads for Gluconic Acid Production • Katsumi Nakao, Tsuyoshi Harada, Keiji Furumoto, Andreas Kiefer and Milan Popovic	816
CFD Modeling of Flow, Macro-Mixing and Axial Dispersion in a Bubble Column • Shirish S. Thakre, Docca V. Phanikumar, Ashok S. Khare and Jyeshtharaj B. Joshi	826
<i>k,a</i> Correlation Established on the Basis of a Neural Network Model • He Yang, Bai S. Fang and Matthias Reuss	838
Model-Based Scale-Up Strategy for Mycelial Fermentation Processes • He Yang and D. Grant Allen	844
Détermination électrochimique du nombre de Sherwood minimum pour un milieu macro-poreux (fritté — lit fixe de grains) • Eudésio Oliveira Vilar et François Coqueret	855
Mass Transfer Coefficients in Reactive Extraction of Lactic Acid from Fermentation Broths in Hollow-Fibre Membranes • Christian Scheler, Milan K. Popovic, Eugene L. Iannotti and Rakesh K. Bajpai	863
Transfert phonétique dans un photoréacteur à écoulement tourbillonnaire • Jérémie Pruvost, Jack Legrand et Patrick Legentilhomme	869
The Effect of a Perfluorochemical Emulsion on Enzyme Reaction Stability • James C. Warrington and Bradley A. Saville	877
Processing Efficiency of Immobilized Non-Growing Bacteria: Biocatalytic Modeling and Experimental Analysis • Jin-Woo Kim, Evgenia I. Rainina, Cady R. Engler and James R. Wild	883
Cell Synchrony and Periodic Behaviour in Yeast Populations • John D. Sheppard and Peter S. S. Dawson	893
A Sporulation Kinetic Model for Batch Growth of <i>B. thuringiensis</i> • David Rivera, Argyrios Margaritis and Hugo de Lasa	903
NOTE: Growth of <i>Rhizobium leguminosarum</i> on Peat in Rotating Bioreactors • Ritika Jauhari, Murray Gray and Greg Holloway	911
NOTE: Amino Acids Profiles in a pH-auxostat • Yen-Han Lin and Wei Ji	917
Model Studies on the Mechanism of Endotoxin Adsorption on Flat-Sheet Microfiltration Membrane Adsorbers • F. Birger Anspach, Dagmar Petsch and Wolf-Dieter Deckwer	921
NOTE: Polyethyleneimine-Containing Sol-Gels as Novel Sorbents for the Removal of Cadmium from Aqueous Solutions • Shirin Bahrami, Amarjeet S. Bassi and Ernest Yanful	931

Design and Experimental Study of Immobilized Soil Bioreactor for In-Well Biodegradation of Pentachlorophenol in Groundwater • Dimitre G. Karamanov, Bruce A. Ramsay and Marie-Claire Hassan . . . . .	936
Biodegradation and Detoxification of Wood Leachate from Pentachlorophenol-Treated Poles • A. Hamid Mollah and D. Grant Allen . . . . .	942
Sequencing Batch Reactor Technology for the Purification of Concentrated Dyehouse Liquors • Martin Hemmi, Rainer Krull and Dietmar C. Hempel . . . . .	948
Bioremediation of Contaminated Air Using an External-Loop Airlift Bioreactor • Vicky Q. Wei, Gordon A. Hill and Douglas G. Macdonald . . . . .	955
The Development of a Medium for the <i>In Vitro</i> Expansion of Mammalian Neural Stem Cells • Arindom Sen and Leo A. Behie . . . . .	963
The Potential of L-Form Bacteria in Biotechnology • Varvara P. Grichko and Bernard R. Glick . . . . .	973

## Regular Articles

Steady Incompressible Fluid Flow Over a Bundle of Cylinders at Moderate Reynolds Numbers • V. K. Satheesh, Raj P. Chhabra and V. Eswaran . . . . .	498
Mixing of Miscible Liquids with Density Differences: Effect of Volume and Density of the Tracer Fluid • Parag R. Gogate and Aniruddha B. Pandit . . . . .	505
Experimental Study on the Simultaneous Adsorption of Carbon Dioxide and Moisture from Nitrogen in Linde 5A Molecular Sieves • Aloke K. Ghosal, Amar N. Samanta and Binoy R. Maiti . . . . .	512
Continuous Separation of Suspensions Containing Light and Heavy Particle Species • Hisham A. Nasr-El-Din, Jacob H. Masliyah and Krishnaswamy Nandakumar . . . . .	518
Surfactant Effects on Gas Absorption in a Coke-Oven Gas Treatment Process • Jui-Fu Shen, Yu-Min Yang and Jen-ru Ma . . . . .	525
Production of Liquid Fuels from Waste Plastics • Donald S. Scott, Piotr Majerski, Jan Piskorz, Desmond Radlein and Michael Barnickel . . . . .	532
Thermal Deactivation Studies of Coconut Shell Pyrolysis • Swati Bandyopadhyay, Ranjana Chowdhury and Gopal Krishna Biswas . . . . .	539
Experimental Study and Mathematical Modeling of Gaseous Toluene Biofiltration by Thermophilic Active Compost • Dimitre G. Karamanov, Yanick Matteau and Bruce A. Ramsay . . . . .	546
Performance Assessment of Processes with Abrupt Changes of Disturbances • Biao Huang . . . . .	553
Model-Based Multivariable Control of the Drying of a Thin Sheet of Fibres in a Continuous Infrared Dryer • Rhamdane Dhib, Normand Thérien and Arthur D. Broadbent . . . . .	560
NOTE: Agitator Design for Solids Suspension under Gassed Conditions • Mary C. Lehn, Kevin J. Myers and André Bakker . . . . .	567
Contents Page from Chemical Engineering Research and Design, September 1999 . . . . .	574
Contents Page from Chemical Engineering Research and Design, October 1999 . . . . .	575
Résumé de la politique concernant les unités SI . . . . .	576
Instructions aux auteurs . . . . .	I.B.C.

December 1999

## Articles

Liquid Wall Friction in Two-Phase Turbulent Gas Laminar Liquid Stratified Pipe Flow • Dag Biberg . . . . .	1073
Influence of Particle-Specific Gravity and Particle Shape on the Averaged Axial Velocity of Nearly Neutrally Buoyant Particles in Horizontal Pipes • S. Liu, P. J. Fryer and J. P. Pain . . . . .	1083
Modeling the Effect of Drop Charge on Coalescence in Turbulent Liquid-Liquid Dispersions • Thomas Tobin and Doraiswami Ramkrishna . . . . .	1090

Effet d'un agitateur mécanique sur l'hydrodynamique et le transfert de matière gaz-liquide en réacteur gazosiphon • Woong Bang, Anne-Marie Duquenne, Henri Delmas et Aimé Bascoul . . . . .	1105
On a Eulerian and Lagrangian Combined Model in Dense Particle-Laden Riser Flow • Jianren Fan, Ping Sun, Yinliang Ma and Kefa Cen . . . . .	1113
Drying of Soybean Seeds in a Crossflow Moving Bed • Marcos A. S. Barrozo, Humberto M. Henrique, Dermeval J. M. Sartori and José T. Freire . . . . .	1121
Dissolution Reaction of Potash Fertilizer with Moisture • Shi-Wen Peng, Graeme Strathdee and Robert W. Besant . . . . .	1127
Extractive Distillation of 2-Methoxy-2-methylpropane + Ethanol Using 1-Butanol as Entrainer: Equilibria and Simulation • Alberto Arce, Eva Rodil and Ana Soto . . . . .	1135
Iron-Molybdenum-Oxide Catalysts for Selective Oxidation of Hydrogen Sulfide to Sulfur • Kuo-Tseng Li and Chun-Hsiung Huang . . . . .	1141
Kinetic Study of Reaction of Hexachlorocyclophosphazene with Phenol by Triphase Catalysis • Ho-Shing Wu and Shang-Shin Meng . . . . .	1146
Parameters of the Epoxidation of 1-Octene by <i>t</i> -Butyl Hydroperoxide • Grzegorz Lewandowski and Eugeniusz Milchert . . . . .	1154
Hypochlorite Production on Ru-Sn Binary Oxide Electrode and its Application in Treatment of Dye Wastewater • Chien-Hsin Yang . . . . .	1161
Esterification of Ethenyl Benzene and its Derivatives with Acetic Acid in the Presence of Perchloric Acid as a Catalyst • Pedro J. Martínez de la Cuesta, Eloísa Rus Martínez, Fuensanta I. Palomino Pérez and Francisca Romero Sarria . . . . .	1169
Pyrolysis of Kraft Lignin in the Presence of Molten ZnCl <sub>2</sub> -KCl Mixture • Mahally Kudsý and Hidehiro Kumazawa . . . . .	1176
Enlèvement du phosphore des eaux usées par traitement à base de tourbe dopée aux boues rouges • Guy Roberge, Jean-François Blais et Guy Mercier . . . . .	1185
Dynamic Modeling of Continuous Evaporative Cooling KCl-NaCl Crystallizers • Abdulsamad Tadayyon and Sohrab Rohani . . . . .	1195
Modeling the Influence of Mineral Rocks, Active in Different Hot Gas Conditioning Systems and Technologies, on the Production of Light $\alpha$ -Olefins • Georgios Taralas . . . . .	1205
Effect of Sound on the Fluidization of Group B Particles • Lii-Ping Leu and Yung Song Yen . . . . .	1215
An Explicit Approximation for the Wetted Angle in Two-Phase Stratified Pipe Flow • Dag Biberg . . . . .	1221
Airside Performance of Herringbone Fin-and-Tube Heat Exchangers in Wet Conditions • Chi-Chuan Wang, Yuan-Jan Du, Yu-Juei Chang and Wei-Han Tao . . . . .	1225
Electrodialysis for Bleach Effluent Recycling in Kraft Pulp Production: Simultaneous Control of Chloride and Other Non-Process Elements • Peter H. Pfromm, Shih-Perrng Tsai and Michael P. Henry . . . . .	1231
Vapour-Liquid Equilibrium of H <sub>2</sub> S-Hydrocarbon Mixtures Using a Generalized Cubic Equation of State • José O. Valderrama, Pedro F. Arce and Ahmed A. Ibrahim . . . . .	1239
Contents Page from Chemical Engineering Research and Design, November 1999 . . . . .	I.B.C.
Table of Contents - 1999 . . . . .	1243
Index of Authors - 1999 . . . . .	1244
Reviewers - 1999 . . . . .	1248
Best Review Award, 1998/1999 . . . . .	1254
Keyword Index - 1999 . . . . .	1257
Call for Papers for the 2000 Canadian Chemical Engineering Conference . . . . .	1258
Demande de communications pour le Congrès canadien de génie chimique de l'an 2000 . . . . .	1263
Instructions to Authors . . . . .	I.B.C.